

The manual is essentially a guide to practical work, but a necessary amount of explanatory matter is included, and an important feature is the insertion throughout of references to standard textbooks which may be consulted most profitably for the acquisition of further and more detailed knowledge upon particular points. A study of the book makes it manifest at once that the author is not only possessed of wide knowledge, but is also a teacher who has found the best method of presenting his subject. The descriptions of the structure of the various animals are given in a clear and simple style, and care has been taken to define as accurately as possible the meaning of all technical terms. The animals described have been selected with great discretion, and with the chief object of presenting as directly as possible the story of the evolution of the various systems. A helpful feature is the insertion at the end of each chapter of a good summary, which briefly correlates the most important facts before the reader passes on to new ground. For a first edition the manual is remarkably free from mistakes, although on page 311 there is a very obvious one, since we are informed that the abducens nerve "penetrates the eyeball at the point of origin of the external rectus muscle."

The manual is not so liberally illustrated as most of its kind; there are only sixty-nine illustrations, but these are simple, clear, and sufficient, since the instructions for dissection are so arranged that any student ought to be able to display and examine all the features referred to in the text and make his own diagrams direct from his dissections. The book concludes with a good index and two appendices, the first dealing with the pronunciation and derivation of technical words, and the second with methods of preparation of materials.

TESTICULAR GRAFTS.

WE have received from Dr. SERGE VORONOFF, director of the laboratory of experimental surgery of the Collège de France, Paris, a copy of his illustrated monograph,⁸ in French, on the subject of testicular grafts, and also an English translation of a paper on the subject, which he had intended to read to the thirty-first French Congress of Surgery in Paris this month; some objection, however, was, we understand, taken, and the paper was, in fact, not read. Dr. Voronoff afterwards gave a lecture which seems to have attracted a good deal of attention in the general press; it may, therefore, be convenient that we should give an early account of Dr. Voronoff's claims.

Dr. Voronoff reported the results of 120 testicular grafts performed on animals to the twenty-eighth French Congress of Medicine in October, 1919, and since then he has applied to man the method which he had practised on animals. The first experiments were made by grafting the testicle of a lamb upon a female sheep; the apparent result was that the growth of bone of the limbs of the progeny of the sheep was modified, the legs being shortened. In other experiments testicles were grafted into young female goats from a male; the ovaries had previously been removed; the goats remained small, their limbs were shorter, and their horns were thicker than those of normal goats. Numerous testicular grafts were made upon castrated animals and he-goats in order to ascertain if transposed testicles could play their ordinary part in animals deprived of their own testicles, and replace them in their functions as endocrine glands. In one case, which Dr. Voronoff gives in detail, the grafted testicles apparently performed their functions as endocrine glands, dominating the secondary sexual characters of the male animal, his sexual instinct, and his virile capacity. Other similar grafts made upon castrated he-goats and rams gave analogous results in every case in which the graft did not slough or was not too quickly absorbed. Testicular grafts were also made upon two senile rams aged about 10 years, with the result that two months later a change in their bearing was observed, and their broken-down air and dull look gave place, it is stated, to a vivacity of movement and a bellicose disposition. Their vigour increased considerably from month to month, and, isolated in separate pens with female sheep, one became the father of a lamb and the other of two. In one of these rams the grafted testicular fragments were removed at the end of fourteen months, when the condition of the animal declined once more and its vivacity disappeared; a new graft was then made, and—while not so rapidly as on the first occasion—some months later there remained no trace of its senile

condition. Several photographs of these animals are given. This experiment, which was repeated several times upon other old animals, apparently showed that the graft could be renewed and successive rejuvenations obtained.

Dr. Voronoff gives particulars of a number of cases of testicular grafts from cynocephalus monkeys which were made upon men between June, 1920, and February, 1921.

In the first two cases the patients had suffered from tuberculosis of the testicles, which had consequently been removed; the grafts provoked latent suppuration and proved unsuccessful, although in the second case the man's beard had commenced to grow again.

The third case was that of a man aged 59, who had had gonorrhoea as a youth, and complained of loss of memory, decreased capacity for intellectual work, and physical depression. Testicular grafting resulted in much improvement in his general health, and he is stated now to experience a physical well-being long unknown to him. He has recovered his memory and his mental vigour has been renewed.

The fourth case was that of a celebrated man of letters, aged 61, who, before the graft, was of a senile type, with wrinkled face and dull eyes; his mental activity had become slow and his memory had failed. Two years after a testicular graft had been performed he recovered a virility he had lost for ten years, was well set up, and gave an impression of youth and vigour; he took long walks and could again work for long hours without fatigue.

In the fifth case the subject was an American, aged 33, who was neurasthenic, melancholic, and dyspeptic. A year after the testicular grafting he enjoyed perfect health and virility, and although Dr. Voronoff suggested to him that a romantic love affair which had ensued might have played a more important part than the graft the patient repudiated the suggestion.

The sixth case was that of a South American of 66, who suffered from senility and depression, aggravated by gastric ulcer; after a testicular graft had been performed he experienced physical well-being and a new sexual vigour.

An Englishman of 74, whom Dr. Voronoff had arranged to exhibit to the Congress, was the seventh patient. Two years before the graft this patient seemed to be an old man, inert, obese, haggard, walking painfully with the aid of a stick. Eight months after the graft was performed he appeared before Dr. Voronoff with half his *embonpoint* gone, his aspect jovial, and his movements active. His condition was stated to-day to be still that of a man who had recovered twenty to twenty-five years of his lost youth. Several photographs of this patient, in vigorous attitudes, are given in the monograph.

Dr. Voronoff does not admit the possibility of grafting the testicles of animals other than monkeys upon man, and human grafts are apparently impossible to procure. From February, 1921, to March, 1922, he was unable to obtain any large monkeys, and no further grafts were made until March, 1922; the results of these later cases were too recent to afford proof of benefit.

Dr. Voronoff thinks that he has established the efficacy of testicular grafting in senile conditions due to the insufficiency of the internal testicular secretion, and not due to affections causing deterioration of essential organs of the body. He does not attribute senility only to the diminution or disappearance of the internal secretion of the genital glands, but he thinks that human force and energy are bound up with the activity of the sexual glands. It is logical, therefore, in Dr. Voronoff's view, to suppose that by supplying the testicular hormone to the body at the moment when its own glands no longer elaborate it the body is really rejuvenated. Whether the testicular graft would be of utility under other conditions, as an organic stimulant of the enfeebled functions of other endocrine glands or of tissues upon which the testicular hormone had a more direct action, are, he states, questions to be decided by further experiment. Placed under the skin or under the muscles, the grafts, even under the most favourable conditions, only survive in part: the centre necroses; the cortex usually survives but is reabsorbed in a few months. Placed, however, in such a position as the peritoneal cavity or the tunica vaginalis, where exudation can be made rapidly, the graft may survive for several years. A graft of the entire testicle may be made, but it must be of small volume and young; for the most part the grafting of fragments is preferable. Dr. Voronoff advises that the testicle should be divided into two, four, six, or eight portions according to its size, the tunica albuginea scarified lightly, and the fragments attached by a catgut stitch above and below in such a way that the glandular face is in contact with the tunica; the fragments should not touch each other, but should be everywhere in direct contact with the tissues of their new host. Dr. Voronoff now supports the view of Professor Retterer, who affirms that the epithelial cells are the agents of the cellular secretion, both internal and external, and that the seminal cell is at once exocrine and endocrine. When in testicular grafts these cells are deprived of the excretory canal they cease to elaborate the spermatozoa, and act only in the endocrine sense; to the interstitial cells a nutritive function is attributed.

⁸ *Greffes Testiculaires*. By Dr. S. Voronoff. Paris: G. Doin. 1922. (Roy. 8vo, pp. 83; 19 illustrations.)